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PALEONTOLOGY.—*Two new genera of Carboniferous inadunate crinoids.*<sup>1</sup> EDWIN KIRK, U. S. Geological Survey.

In a former communication to this Journal (Kirk, 1938) several crinoid genera were discussed. These genera centered about *Zeacrinus*, either through genetic affinity or because of assignment of some of their species to that genus by authors. Two new genera, closely related to some of the crinoids dealt with, were omitted owing to nomenclatorial uncertainties. The location and examination of the type specimen of an early and obscure species resolved these difficulties.

In the meantime, a new genus, *Xystocrinus*, has been made by Moore and Plummer. The type species chosen, *Cyathocrinus depressus* Troost, is a typical *Zeacrinus*. Following a long series of errors by authors, Moore and Plummer seem to have had an erroneous idea of the species they chose as type, confusing it at least in part with *Tholocrinus spinosus* (Wood).

The name *Zeacrinus depressus* (Troost) has had a curious history. The type specimen of *Zeacrinus depressus* during Wachsmuth's lifetime was in Hall's Museum at Albany and inaccessible. The only means of identification were the description and excellent line drawings in the Iowa report. Someone, perhaps Wachsmuth himself, decided that certain crinoids from Sloans Valley, Ky., were *Zeacrinus depressus* and referred them to *Hydreionocrinus*. Thus, when Wetherby (1881, p. 325 (2), pl. 9, figs. 1-4, 6) figured the species he called it *H. depressus* under protest, citing Wachsmuth as authority. In the meantime the large series of similar specimens in the Wachsmuth and Springer collection carried the *depressus* label in Wachsmuth's writing, which has remained to this day. Springer (1926, pp. 88, 90, pl. 26, figs. 1-12) briefly described and very fully illustrated this species as *H. depressus*. This work was done away from the collection and with limited access to the literature. Springer had the type specimen of *Zeacrinus depressus* in the same drawer and must have known that the two forms were neither conspecific nor congeneric. It was a most

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unfortunate mistake. Moore and Plummer (1938, p. 271) proposed a new genus *Xystocrinus*, with *Zeacrinus depressus* (Troost) ("Hall") as genotype. As illustrations of the species they gave pen and ink drawings of two of Springer's figures. The type of *Zeacrinus depressus* was examined by both Moore and Plummer, and it is strange they followed the *lapsus* of Springer.

Thirty years ago Wood (1909, pp. 92, 93, pl. 11, figs. 6-8) gave excellent illustrations and description of the type specimen of *Zeacrinus depressus*, referring it to *Hydreionocrinus*. For Wetherby's species referred to *H. depressus* by Wachsmuth, the history of which has been outlined above, Wood gave the new name *H. spinosus*.

There has appeared recently a much-needed revision of the genus *Zeacrinus* by Sutton and Hagan (1939). A few species referred by them to *Zeacrinus* will have to come out. In particular, the species referred by me to my genus *Eratocrinus*, to which they take exception (p. 87), are certainly not referable to *Zeacrinus*. They do, however, agree very well with *E. elegans* (Hall). It should be noted that two of the "species" listed by Sutton and Hagan, *E. ramosus* (Hall) and *E. troostanus* (Meek and Worthen), are based on immature individuals and might possibly fall into synonymy.

The ascription by Sutton and Hagan and most authors of the genotype of *Zeacrinus*, *Zeacrinus magnoliaeformis*, to Owen and Norwood 1847 (not 1846 as cited) is incorrect. In this paper Owen and Norwood figured a specimen of *Zeacrinus magnoliaeformis* but in the text (1847, p. 5) merely called it "the beautiful *Encrinite*, fig. 13." The correct citation is that given by me (1938, p. 160). The authority for the genus and species as of Troost can not be got around. The footnotes of Hall (1858, p. 544) seem to have escaped authors generally and validate Troost's names under any prevailing code.

The species here referred to the two new genera proposed are those in regard to which I feel reasonably certain, either from examination of the types or well-authenticated specimens. *Dasiocrinus spinosus* (Owen and Shumard) is of special interest. The original figure was very poor, and the species was cited by Wachsmuth and Springer as "undeterminable." The type specimen has been found at the Walker Museum of the University of Chicago and proves to be a splendidly preserved crinoid.

#### **Tholocrinus**, n. gen.

*Genotype*.—*Hydreionocrinus spinosus* Wood.

*Generic diagnosis*.—

Crown. Subcylindrical, short.

Dorsal cup. Depressed, bowl-shaped, with invaginated base.

IBB. Small, within basal pit, and concealed by column.

BB. Of approximately equal width and height, except post B, which is proportionally higher. Proximal portions of BB take part in basal pit.

RR. Large. Articulating suture extending full width of R, slightly curved, not gaping.

IBr. One in all rays, except the anterior, which is variable. Here there may be one, or a IBr<sub>1</sub>, separated from the IAx by a set of biserial or interlocking Br. In such case the structure is essentially that of the IIBr series and is probably homologous, the structure of the anterior ray representing a suppression of one-half the division usually taking place on the IBr<sub>1</sub>. The IBr tend to be nodose or spinose.

Arms. The arms are short, stout, and endotomous. The axillaries are relatively large and tend to be nodose. Following each Ax the first brachial is relatively large. Between it and the succeeding Ax the brachials interlock or have a biserial arrangement. The Br of the admedian rami are biserial or nearly so.

Post IR. Three anal plates in cup. RA large, not penetrating deeply between post B and R post B, meeting R post B on narrow face and post B on a much longer one. X meets post B on a wide, horizontal face and rises above the level of the RR. RT is large and extends well above the level of the RR.

Ventral sac. The ventral sac is proportionally very large. Distad it contracts somewhat to about one-half its height, then expands, giving the sac an elongate hourglass shape. The opening lies about one-half the height of the sac. The sac is capped by a low-arched structure, consisting either of spinose plates alone or spinose marginal plates separated at the margin by smaller nonspinose plates and by a central group of smaller plates.

*Characteristic species of the genus.*—

**Tholocrinus armiger** (Meek and Worthen), n. comb.

*Poteriocrinites (Zeacrinus?) armiger* Meek and Worthen, p. 27, 1870.

"Chester, Pope County, Illinois."—Meek and Worthen, p. 547, pl. 21, figs. 3a, b, 1873.

*Hydreionocrinus armiger* Wachsmuth and Springer, p. 131 (356), 1880.

**Tholocrinus spinosus** (Wood), n. comb.

*Hydreionocrinus spinosus* Wood, in Troost, p. 93, 1909.

In error

*Hydreionocrinus depressus* (Troost) Wetherby ("Wachsmuth non Wetherby"), p. 326 (2), pl. 9, figs. 1-4, 6, 1881.—Wachsmuth and Springer, p. 245 (169), 1886.—Springer, pp. 89, 90, pl. 26, figs. 1-12, 1926.

*Xystocrinus depressus* Moore and Plummer (part), p. 269, fig. 21, 1938.

**Tholocrinus wetherbyi** (Wachsmuth and Springer), n. comb.

*Hydreionocrinus wetherbyi* Wachsmuth and Springer, p. 245 (169), 1886.

In error

*Hydreionocrinus armiger* (Meek and Worthen) Wetherby ("Wachsmuth non Wetherby"), p. 328 (5), pl. 9, figs. 7-11, 1881.

*Geological and geographic distribution.*—The genus is widely distributed in Mississippi Valley and Kentucky, where beds of upper Chester are found.

*Relationships.*—*Tholocrinus* probably has its nearest relationships with *Linocrinus*. It differs chiefly from *Linocrinus* in the flattened, spinose mushroom-shaped distal portion of the ventral sac, the smoothness of plates, the more advanced stage of evolution of the anal plates, and in having biserial or nearly biserial arms. From *Hydreionocrinus* it chiefly differs in the smoothly rounded cup with invaginated base and in its endotomous arm structure as against what may be called the ectotomous arms of *Hydreionocrinus*.

#### **Dasciocrinus**, n. gen.

*Genotype.*—*Cyathocrinus florealis* Yandell and Shumard.

*Generic diagnosis.*—

Crown. Subcylindrical, high.

Dorsal cup. Depressed-turbinate, with invaginated base.

IBB. Small, concealed by column within small basal pit.

BB. Relatively small, the proximal portions taking part in the basal pit.

RR. Large. Articulating suture extends full width of R; linear, gaping.

I Br. One in all rays, tending to be nodose or spinose.

Arms. Long, slender, endotomous, with few divisions. The first division above the main dichotomy is high above the I Ax, giving a large number of I I Br. In the ant R there tend to be fewer divisions, which are more nearly isotomous. All axillaries tend to be nodose. Br cuneate.

Post IR. Three anal plates in cup. RA large, elongate, penetrating deeply between and resting upon post and r post BB. X relatively small, narrow, meeting post B on a narrow face or separated from it. RT small, meeting RA on a very narrow face.

Ventral sac. The ventral sac is as long as the arms or extends somewhat beyond them. Spinose processes commonly occur on a few of the distal plates of the sac, three or four being the usual number. The anal opening is lateral in position and lies near the distal end of the sac.

*Characteristic species of the genus.*—

#### **Dasciocrinus florealis** (Yandell and Shumard), n. comb.

*Cyathocrinus floralis* Yandell and Shumard, p. 24, pl. fig. 1, 1847.

"Grayson Springs, Kentucky." (Upper Chester, Glen Dean.)

*Poteriocrinus florealis* Shumard, p. 217, 1855.

*Zeacrinus florealis* Shumard, p. 399, 1866.—Wachsmuth and Springer, p. 128 (353), 1880.

*Pachylocrinus florealis* Springer, p. 72, pl. 16, figs. 8, 9, 1926.

#### **Dasciocrinus spinifer** (Wetherby), n. comb.

*Scaphiocrinus spinifer* Wetherby, p. 157 (14), pl. 5, fig. 5, 1880.

"Pulaski County, Kentucky, Kaskaskia (Chester) Group." (Glen Dean).—Wachsmuth and Springer, p. 236 (160), 1886.

#### **Dasciocrinus spinosus** (Owen and Shumard), n. comb.

*Poteriocrinus spinosus* Owen and Shumard, p. 91, pl. 11, fig. 4, 1852.—Owen and Shumard, p. 596, pl. 5b, fig. 4, 1852a. "Archimedical layers of the carboniferous limestone of Kaskaskia, Illinois." Associated with "*Pentremites florealis*, *P. pyriformis*, . . . and *Poteriocrinus* (*Zeacrinus*) *magnoliaformis* Troost."

*Zeacrinus spinosus* Shumard, p. 399, 1866.

*Geologic and geographic distribution.*—The genus is widely distributed in the Mississippi Valley and in Kentucky in beds of Chester age. There is an undescribed species in the Ste. Genevieve near Huntsville, Ala.

*Relationships.*—*Dasciocrinus* is related to *Tholocrinus*, from which it differs chiefly in its long, slender crown and arms; lack of a pronounced terminal mushroom expansion of the ventral sac; and the depressed turbinate cup as compared with the smoothly rounded cup of *Tholocrinus*.

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